

2013 International Workshop on EUV Lithography

**Panel Discussion:
Introduction (P75)**

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Outline

- “EUVL HVM Insertion and Scaling” – summary of panel input from 2012
- Highlights of EUVL Development Since June 2012
- Introduction of panel questions

Panel Discussion Summary from 2012

- **Yan Borodovsky (P5), Intel Corporation:**
- **Adopt EUVL when yields and COO will become beneficial. Logic complementary and DRAM Contact Litho will drive early EUV HVM adoption**
- **1000 W Source will be needed.** Need to evaluate alternate concepts – liquid metal jet (Koshelev), new DPP supplier? FEL, Laser Compton effect, higher rep rates, what about 11 nm Xe?
- Full 100 WPH or more at insertion, gradual during Pilot phase
- Stay at 0.33 NA and 13.5 nm
- **Even if initial cost is large, if tools can be used for long time, investments can be recovered**

Panel Discussion Summary from 2012

- **Takashi Kamo – Toshiba**

- EUV-AIMS will not be available at the early stage of HVM. Use 3D-SEM and Litho simulation as alternative
- **Need mask R&D for high NA and shorter wavelength**

- **Pawitter Mangat, GlobalFoundries**

- **2016 is the earliest opportunity for HVM insertion, most probably in 2017**
- Need to match productivity with 193i tools
- **All success is dependent on source power**
- **We must need to make it work at 13.5 before changing the wavelength**

EUVL Highlights (June 2012 - June 2013)

- **EUV Source**
 - Acquisition of Cymer by ASML
 - Ushio stopped working on DPP for HVM – making LPP as the only technology available today for HVM sources
 - Cymer has demonstrated 55 W (1 hour stable run) and 4B pulse life time for collector (40 Hours)
 - Sources remain the main hurdle for EUVL insertion into HVM

EUVL Highlights (June 2012 - June 2013)

- **Scanners, mask and patterning**
 - NXE 3300 B are scheduled for shipping in 2013
 - Intel pilot line demonstrated 22 nm products and source power and particles added during manufacturing are the main EUVL issues
 - Resist top coat can help eliminated OOB radiation
 - Hybrid / high absorbing resists are needed to reduce dose requirements
 - DSA and DPT will become EUVL enabling technologies. EUVL – DPT demonstrated 9 nm L/S
 - 9 inch masks may be needed for high NA scanners

Questions for Panelists

- **EUV HVM Timelines**

- What are the HVM Litho roadmaps for next 10 years?
 - Node and device type and choice of lithography technique. What type of Litho options can meet the requirements (EUV, immersion – double, triple, quadruple, other choices and their readiness)?
 - When you expect 450 mm insertion?
 - What are the lithography requirements for 300 mm and 450 mm scanners?
- At what node do you expect EUVL to be competitive with 193 nm lithography and for what throughput? Will this comparison be for 300 mm and 450 mm wafers?

Questions for Panelists

- **What are the EUV source requirements** as a function of NA, Resolution, throughput metric for 300mm and 450mm?
- **450mm 193i Contingencies**
 - What are the panelists perspectives on whether 300mm EUV HVM will precede 450mm or will 450mm start with 193i Multi-patterning and then migrate to EUV 450mm?
 - **Panelists opinion about multi-patterning EUV vs. BEUV (6.x nm) for future nodes**